

UNITED STATES PATENT OFFICE.

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METHOD OF DISSOLVING AND RECOVERING RUBBER.

No. 805,903.

Specification of Letters Patent.

Patented Nov. 28, 1905.

Application filed March 3, 1905. Serial No. 248,324.

To all whom it may concern:

Be it known that I, GEORGE ALBERT LLEW-
ELYN CLIFT, chemist, a subject of the King
of Great Britain, residing at 42 Edward street,
5 West Bromwich, in the county of Stafford,
England, have invented certain new and use-
ful Improvements in Methods of Dissolving
and Recovering Rubber, of which the follow-
ing is a specification.

10 This invention has for its object the appli-
cation of a discovery I have made that pyri-
din and kindred bases or that mixture of
pyridin and kindred bases commercially
known as "heavy bases," extracted from coal-
15 tar and other sources, such as bone-oil, are
solvents for rubber, to the purpose of recov-
ering serviceable rubber from waste rubber
scraps and refuse containing rubber, such as
are produced in large quantities in many
20 trades, and to the purpose of producing rub-
ber solutions for use as such.

In carrying out this invention for the re-
covery of serviceable rubber from waste
scraps or refuse containing rubber the rub-
25 ber material is mixed with the pyridin or
a base of the pyridin group in a vessel and
the rubber thus dissolved, leaving the impuri-
ties undissolved. This part of the process
is conveniently carried out by the use of a
30 number of tanks containing the solvent, into
which the material to be dissolved is lowered
within a cage or basket, first into one tank
and then into the next throughout the whole
series until the whole of the rubber has been
35 dissolved, or by the use of a number of tanks
into each of which material to be dissolved is
lowered within a cage or basket, and into the
whole series of which the solvent is pumped
successively from tank to tank, fresh solvent
40 being pumped into the tank of the series
which at the time contains the nearly-dis-
solved material and the nearly-spent solvent
into the tank which at the time contains the
fresh material, the solvent passing from the
45 first-mentioned to the other tank through
the intermediate tanks in what is the succes-
sion of tanks at the time, these methods of
working dissolving-tanks in series being well
understood. When the solvent within any
50 tank has taken up as much of the rubber as is
conveniently practicable, the solution is sepa-
rated from any impurities and neutralized
with an acid, such as sulfuric, when the rub-

ber separates out. The process of dissolv-
ing the rubber is quickened by heating the 55
solvent and maintaining it at as high a tem-
perature, such as about 100° centigrade, as
will not decompose the rubber, and the heat-
ing is conveniently effected by the aid of
steam-coils within the tanks, and the process 60
is further facilitated by agitation, such as by
revolving the baskets within the tanks, and
it is of course advisable to use the material to
be dissolved in the form of small pieces. The
tanks are preferably closed when at work and 65
are provided with reflex condensers.

The solvent may be recovered after hav-
ing been neutralized by an acid by any of
the well-known methods.

Preferably before, but it might be simulta- 70
neously with, the neutralizing of the solution
with an acid, as above described, coal-tar
benzol or other naphtha or any of the usual
solvents of rubber which are admissible to be
used with bases of the pyridin group which 75
are insoluble in dilute acids and are capable
of being evaporated at temperatures which
will not injure the rubber may be added to
the liquid in the proportion of about five gal-
lons of commercial benzol or the other naph- 80
tha or solvent to one gallon of the liquid to
take up the rubber thrown out by the acid
and give a solution of rubber in the benzol or
other naphtha or solvent, which solution
separates out in a distinct layer from the py- 85
ridin or bases of the pyridin group when
these have been neutralized with acid and
may be decanted off therefrom. The addi-
tion of the lighter solvent facilitates the sepa-
ration of the rubber from the pyridin or 90
other base of that group, and the benzol or
lighter solvent may be recovered from the
rubber by being distilled off therefrom by
means of steam or by vacuum distillation or
by any other well-known means by which 95
rubber may be separated from benzol or
other naphtha or solvent, and both rubber
and lighter solvent be recovered in service-
able form. The solution of rubber in the
coal-tar benzol or other naphtha or solvent, 100
however, is itself useful for many purposes,
and the solution of rubber formed by treat-
ing waste or other rubber with pyridin or
bases of the pyridin group may be utilized
as such for many purposes, and the inven- 105
tion comprises the preparation of such a so-

lution to be used as such by the treatment of serviceable rubber with pyridin or bases of the pyridin group.

On the ground both of expense and of efficiency it is preferred to use heavy bases as the solvent, according to this invention, for the rubber rather than pyridin or kindred bases alone or mixed together as they might be.

Instead of throwing out the rubber from its solution in pyridin or kindred bases or heavy bases by means of an acid, it may be thrown out by any reagent—such as wood-spirit or amyl alcohol, which when mixed with the solution of rubber in pyridin or kindred bases or heavy bases destroys the power which the solvent otherwise has of dissolving rubber and precipitates rubber therefrom. This process, however, is not applicable when the rubber is to be thrown out of the solution in the presence of the benzol or other naphtha or solvent.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described method of recovering rubber, which consists in first dissolv-

ing out the rubber with a base of the pyridin group, and then separating the rubber from such solution with a reagent.

2. The herein-described method of recovering rubber from waste, which consists in first dissolving out the rubber with a base of the pyridin group, then precipitating the rubber from such solution with a reagent, and then recovering the base by suitable means.

3. The herein-described method of forming a solution of rubber in a volatile solvent, which consists in first dissolving waste rubber in a base of the pyridin group, then treating such solution with an acid in the presence of the volatile solvent for the separation of the rubber from the said base and its solution in the said solvent, and then separating off the said solvent, with the rubber in solution therein.

In witness whereof I have hereunto signed my name this 22d day of February, 1905, in the presence of two subscribing witnesses.

GEORGE A. L. CLIFT.

Witnesses:

ROBERT G. GROVES,
PAUL HÜFFNER.